#23/Req. for Recon. 8/6/02 Hawkins

Practitioner's Docket No.: 789_056 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: Yukihisa TAKEUCHI and Kazuyoshi SHIBATA

Ser. No.: 09/677,304 Group Art Unit: 2834

Filed: September 29, 2000 Examiner: Dougherty, T.

Confirmation No.: 2413

For: PIEZOELECTRIC/ELECTROSTRICTIVE DEVICE

CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on *August 2, 2002* at (703) 872-9319.

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AUG 2 2002

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REQUEST FOR RECONSIDERATION

Sir:

The following remarks are in response to the Final Office Action mailed April 4, 2002.

Examiner Dougherty is thanked for courtesies extended to Applicants' undersigned representative during a telephonic interview on June 27, 2002. The substance of that interview has been incorporated into the following remarks.

1. Claims 1-7 are pending herein. Claims 1-3, 6 and 7 were rejected under §103(a) over Aoki. This rejection is respectfully traversed.

The PTO is contending that one skilled in the art would have found it obvious to modify Aoki's bimorph-type piezoelectric actuator to omit a piezolectric/electrostrictive (P/E) element on one side of one of Aoki's thin plate sections to thus provide unimorph actuators instead. It is noteworthy that the PTO has failed to cite any references in support of its position that bimorph actuators are equivalent to unimorph actuators.

In an attempt to support this position, the PTO states that "it has been held that omission of an element and its function in a combination where the remaining elements

perform the same functions as before involves only routine skill in the art" (page 3 of the Office Action). Applicants respectfully submit, however, that omitting one of Aoki's P/E elements would not result in a device "where the remaining elements perform the same function as before."

Aoki discloses the use of bimorph P/E elements in a piezoelectric actuator. Pending claim 1 recites, however, that one or more unimorph P/E elements are arranged on at least one thin plate section. Applicants respectfully submit that there is a distinct difference between unimorph and bimorph actuators, as will be explained below.

Fig. 9(a) of Aoki, which is reproduced below in annotated form, shows a common electrode sandwiched between two P/E layers (I and II) to form two, spaced bimorph P/E elements. While compressive forces are generated at positions A and D, tensile forces are generated at positions B and C. In Aoki's bimorph structure, compressive force A and tensile force B are each generated by first P/E element I. Tensile force C and compressive force D are each generated by second P/E element II. In operation, as the first P/E element I compresses at position A, the second P/E element II expands at position C. Similarly, as the second P/E element II compresses at position D, the first P/E element I expands at position B.

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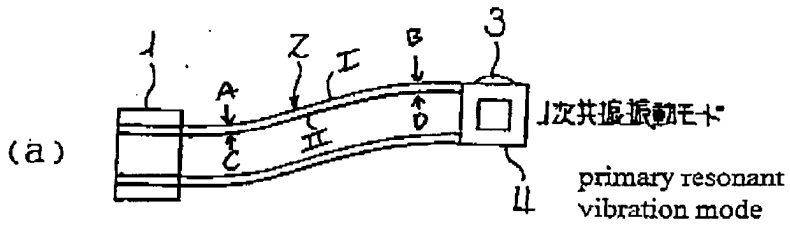

Fig. 9(a) of Aoki illustrates a resonant condition. More specifically, Aoki's bimorph P/E elements are driven at a single, primary resonant frequency. As such, Aoki's electrodes are specifically designed to suppress amplitudes at higher-order resonant frequencies, which results in Aoki's bimorph P/E device being driven only at the desired primary resonant frequency. Aoki, therefore, teaches that the resonating pattern illustrated in Fig. 9(a) is the intended result when operating Aoki's P/E device at the primary resonant frequency, regardless of the positioning of the electrodes in Aoki's P/E device.

There is no disclosure in Aoki that would have motivated one to omit one of Aoki's P/E elements from one side of Aoki's thin plate sections, as asserted by the PTO.[1] Skilled artisans would readily understand that substituting Aoki's bimorph P/E element structure with a unimorph P/E element structure would result in Aoki's P/E element having a decreased thickness, which, in turn, would have the following effects: the resonant frequency would decrease; the weight of the P/E element would decrease; and the overall generating power of the actuator would be diminished. As such, omitting one of the P/E elements from Aoki's bimorph structure would render the resonant condition or displacement action shown in Fig. 9(a) unobtainable without further significant *and undisclosed* modifications of Aoki's P/E device.[2]

For example, if electrodes were positioned only in the central part of Aoki's P/E element and driven at a frequency lower than the primary resonant frequency, only that part of the P/E element would be displaced. Consequently, Aoki's P/E elements would resonate at a

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[1] When relying upon a modification of prior art, it is incumbent upon the Examiner to identify some suggestion to make the modification. *In re Jones*, 958 F.2d 347, 351, 21 USPQ 2d 1941, 1943 (Fed. Cir. 1192).

[2] Again, the PTO has failed to cite any references that support the contention that a skilled artisan would consider unimorph and bimorph actuators to be equivalent or interchangeable.

decreased frequency, which would be different from the desired resonating pattern. Thus, if one of Aoki's P/E elements were omitted as asserted by the PTO, the resultant structure would yield inferior displacement performance. Applicants respectfully submit that there certainly would have been no motivation for one skilled in the art to modify Aoki to gain *inferior* performance characteristics.

In view of the foregoing, reconsideration and withdrawal of the §103 rejection over Aoki are respectfully requested.

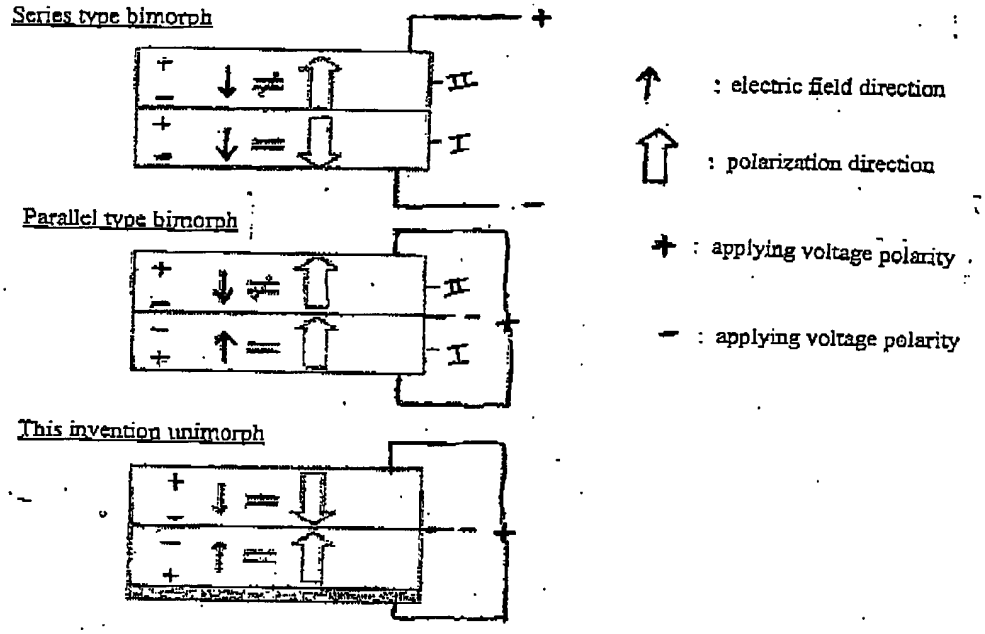
During the telephonic interview, Examiner Dougherty questioned whether Fig. 1 in the present application shows P/E elements that could be interpreted as being bimorph P/E elements. In response to Examiner Dougherty's query, Applicants submit the following discussion.

First and foremost, the present specification states that the P/E elements are unimorph structures (specification, page 22, line 26).

Secondly, applicants respectfully submit that one skilled in the art would understand that classifying a P/E element as either a unimorph or a bimorph is not merely a function of the number of P/E layers; one must also consider the directions of P/E layer polarization and electric field application to the P/E layers. Based on the discussion below, it is clear that Aoki discloses bimorph P/E elements that are distinct from the unimorph P/E elements of the present invention.

As shown in the drawing below, bimorph P/E elements are generally classified into series or parallel type structures, each of which includes first and second P/E layers sandwiching a supporting substrate. In the first P/E layer I, a direction of P/E layer polarization and a direction in which an electric field is applied to the first P/E layer are the same. In the second P/E layer II, a direction of P/E layer polarization and a direction in which

the electric field is applied to the second P/E layer are opposite to one another. In a series-type bimorph, the polarization directions are opposite, and in a parallel-type bimorph, the polarization directions are the same.



The unimorph P/E elements of the present invention include multiple P/E layers *on the same side* of a supporting substrate, a primary distinction over bimorph P/E actuators. In addition, in a unimorph P/E actuator, the direction of P/E layer polarization and the direction in which an electric field is applied to the P/E layer is the same in both P/E layers, as shown above. Alternatively, the directions of P/E layer polarization and the application of the electric field to the P/E layer can be opposite to one another in **both** P/E layers. In contrast to the series and parallel type bimorph P/E elements discussed above, the stacked-type P/E layers in the unimorph P/E element of the present invention do not, however, include an arrangement in which the directions of P/E layer polarization and electric field application are the same direction in one P/E layer and are opposite to one another in the other P/E layer.

It is unequivocal that one skilled in the art readily understands that unimorph and bimorph P/E actuators are distinct, and one would not simply replace one for the other as a matter of "routine skill," as asserted by the PTO.

For all of the foregoing reasons, Applicants respectfully submit that all pending claims herein are in condition for allowance. Accordingly, Examiner Dougherty is requested to issue a Notice of Allowance for this application in due course.

If Examiner Dougherty believes that further contact with Applicants' attorney would be advantageous toward the disposition of this case, he is herein requested to call Applicants' attorney at the phone number noted below.

Examiner Dougherty is requested to confirm receipt and consideration of the IDS filed June 26, 2002.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

August 2, 2002
Date

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